



**SPACE OPTICS MANUFACTURING
TECHNOLOGY CENTER**

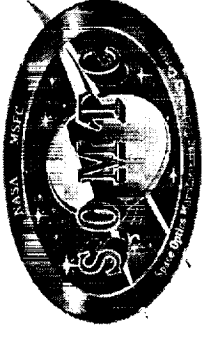


**MSFC Surface Metrology
(Surface Morphology)**

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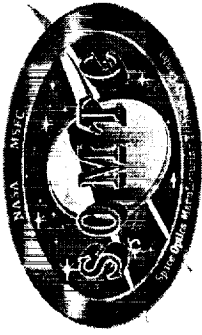
Facilities/Major Equipment



- Taylor-Hobson Nanostep II, stylus-type profiler
 - Very high-resolution vertical resolution
 - 310 picometer vertical resolution w/ 20 μm range
 - 31 picometer vertical resolution w/ 2 μm range
 - 50 mm maximum scanlength
 - 120,000 lateral data points per scan
 - 0.05 μm per step for < 6 mm scan length
 - 0.50 μm per step for μ 6 mm scan length
 - Diamond stylus sizes:
 - Conical w/ 1 μm , 2 μm , & 5 μm radius tips
 - Truncated pyramid, 0.1 x 2.0 μm tip (high-resolution)



Taylor Hobson NanoStep II (*photograph 4*)





Facilities/Major Equipment (cont.)



- Topometrix SPM System
 - Atomic Force Microscope
 - Scanning Tunneling Microscope
 - Conductive samples only
 - “Discoverer” unit for small parts ([25 mm)
 - Superior vibration isolation
 - “Explorer” unit for large parts
 - Can accommodate large optics by resting on the optical surface



Topometrix SPM (*photograph 5*)





Surface Metrology Applications



- High-Resolution Surface Roughness Measurement

- Power spectral cross-comparisons
 - WYKO
 - 0.3 μm to 9 mm, lateral dimension range*
 - NanoStep
 - 0.1 μm to 50 mm, lateral dimension range*
 - AFM and STM
 - 1 nm to 75 μm , lateral dimension range*

* Note: the listed lateral dimension range is the total integrated range covered by all available objectives, tips or scanners for the given instrument.



Surface Metrology Applications (cont.)



- Film Thickness/Step Height
 - Coating calibrations
 - Diffraction grating analysis
- Surface Morphology Analysis
 - Grain sizes and heights
 - Porosity